

**Appendix C**  
**BEST MANAGEMENT PRACTICES FOR FORESTRY IN MONTANA**  
**December 1997**

**I. DEFINITIONS**

1. "Hazardous or toxic material" means substances which by their nature are dangerous to handle or dispose of, or a potential environmental contaminant, and includes petroleum products, pesticides, herbicides, chemicals, and biological wastes.
2. "Stream," as defined in 77-5-302(7), MCA, means a natural water course of perceptible extent that has a generally sandy or rocky bottom or definite banks and that confines and conducts continuously or intermittently flowing water.
3. "Streamside Management Zone (SMZ)" or "zone" as defined at 77-5-302(8), MCA means "the stream, lake, or other body of water and an adjacent area of varying width where management practices that might affect wildlife habitat or water quality, fish, or other aquatic resources need to be modified." The streamside management zone encompasses a strip at least 50 feet wide on each side of a stream, lake, or other body of water, measured from the ordinary high water mark, and extends beyond the high water mark to include wetlands and areas that provide additional protection in zones with steep slopes or erosive soils.
4. "Wetlands" mean those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, swamps, bogs, and similar areas.
5. Adjacent wetlands are wetlands within or adjoining the SMZ boundary. They are regulated under the SMZ law.
6. Isolated wetlands lie within the area of operation, outside of the SMZ boundary, and are not regulated under the SMZ law.

**II. STREAMSIDE MANAGEMENT**

The Streamside Management Law (77-5-301 through 307 MCA) provides minimum regulatory standards for forest practices in streamside management zones (SMZ). The "Montana Guide to the Streamside Management Zone & Rules" is an excellent information source describing management opportunities and limitations within SMZs.

### **III. ROADS**

#### **A. Planning and Location**

1. Minimize the number of roads constructed in a watershed through comprehensive road planning, recognizing intermingled ownership and foreseeable future uses. Use existing roads, unless use of such roads would cause or aggravate an erosion problem.
2. Review available information and consult with professionals as necessary to help identify erodible soils and unstable areas, and to locate appropriate road surface materials.
3. Fit the road to the topography by locating roads on natural benches and following natural contours. Avoid long, steep road grades and narrow canyons.
4. Locate roads on stable geology, including well-drained soils and rock formations that tend to dip into the slope. Avoid slumps and slide-prone areas characterized by steep slopes, highly weathered bedrock, clay beds, concave slopes, hummocky topography, and rock layers that dip parallel to the slope. Avoid wet areas, including moisture-laden or unstable toe slopes, seeps, wetlands, wet meadows, and natural drainage channels.
5. Minimize the number of stream crossings and choose stable stream crossing sites.
6. Locate roads to provide access to suitable (relatively flat and well-drained) log landing areas to reduce soil disturbance.

#### **B. Design**

1. Properly design roads and drainage facilities to prevent potential water quality problems from road construction.
2. Design roads to the minimum standard necessary to accommodate anticipated use and equipment. The need for higher engineering standards can be alleviated through proper road-use management.
3. Design roads to balance cuts and fills or use full bench construction (no fill slope) where stable fill construction is not possible.
4. Design roads to minimize disruption of natural drainage patterns. Vary road grades to reduce concentrated flow in road drainage ditches, culverts, and on fill slopes and road surfaces.

### **C. Drainage from Road Surface**

1. Provide adequate drainage from the surface of all permanent and temporary roads. Use outsloped, insloped or crowned roads, and install proper drainage features. Space road drainage features so peak flow on road surfaces or in ditches will not exceed capacity.
  - a. Outsloped roads provide a means of dispersing water in a low-energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety can be met.
  - b. For in-sloped roads, plan ditch gradients steep enough, generally greater than 2% but less than 8%, to prevent sediment deposition and ditch erosion. The steeper gradients may be suitable for more stable soils; use the lower gradients for less stable soils.
  - c. Design and install road surface drainage features at adequate spacing to control erosion; steeper gradients require more frequent drainage features. Properly constructed drain dips can be an economical method of road surface drainage. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.
2. For ditch relief culverts, construct catch basins with stable side slopes. Protect the inflow end of crossdrain culverts from plugging and armor if in erodible soil. Skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to help maintain proper function.
3. Where possible, install culverts at the gradient of the original ground slope; otherwise, armor outlets with rock or anchor downspouts to carry water safely across the fill slope.
4. Provide energy dissipaters (rock piles, slash, log chunks, etc.) where necessary to reduce erosion at outlet of drainage features. Crossdrains, culverts, water bars, dips, and other drainage structures should not discharge onto erodible soils or fill slopes without outfall protection.
5. Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.
6. Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment doesn't reach surface water. Install road drainage

features above stream crossings to route discharge into filtration zones before entering a stream.

**D. Construction** (see also Section IV on stream crossings)

1. Keep slope stabilization, erosion and sediment control work current with road construction. Install drainage features as part of the construction process, ensuring that drainage structures are fully functional. Complete or stabilize road sections within same operating season.
2. Stabilize erodible, exposed soils by seeding, compacting, riprapping, benching, mulching, or other suitable means.
3. At the toe of potentially erodible fill slopes, particularly near stream channels, pile slash in a row parallel to the road to trap sediment. When done concurrently with road construction, this is one method that can effectively control sediment movement, and it can also provide an economical way of disposing of roadway slash. Limit the height, width and length of "slash filter windrows" so wildlife movement is not impeded. Sediment fabric fences or other methods may be used if effective.
4. Minimize earthmoving activities when soils appear excessively wet. Do not disturb roadside vegetation more than necessary to maintain slope stability and to serve traffic needs.
5. Construct cut and fill slopes at stable angles to prevent sloughing and other subsequent erosion.
6. Avoid incorporating potentially unstable woody debris in the fill portion of the road prism. Where possible, leave existing rooted trees or shrubs at the toe of the fill slope to stabilize the fill.
7. Consider road surfacing to minimize erosion.
8. Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.
9. Minimize sediment production from borrow pits and gravel sources through proper location, development and reclamation.
10. When using existing roads, reconstruct only to the extent necessary to provide adequate drainage and safety; avoid disturbing stable road surfaces. Prior to

reconstruction of existing roads within the SMZ, refer to the SMZ law.  
Consider abandoning existing roads when their use would aggravate erosion.

#### **E. Maintenance**

1. Grade road surfaces only as often as necessary to maintain a stable running surface and adequate surface drainage.
2. Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.
3. Avoid cutting the toe of cut slopes when grading roads, pulling ditches, or plowing snow.
4. When plowing snow, provide breaks in snow berm to allow road drainage.
5. Haul all excess material removed by maintenance operations to safe disposal sites and stabilize these sites to prevent erosion. Avoid sidecasting in locations where erosion will carry materials into a stream.
6. Avoid using roads during wet periods if such use would likely damage the road drainage features. Consider gates, barricades or signs to limit use of roads during spring break up or other wet periods.
7. Upon completion of seasonal operations, ensure that drainage features are fully functional. The road surface should be crowned, outsloped, insloped, or water-barred. Remove berms from the outside edge where runoff is channeled.
8. Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; reseed and/or scarify; and, if necessary, recontour and provide water bars or drain dips.

### **IV. TIMBER HARVESTING, AND SITE PREPARATION**

#### **A. Harvest Design**

1. Plan timber harvest in consideration of your management objectives and the following:
  - a. Soils and erosion hazard identification.
  - b. Rainfall.
  - c. Topography.
  - d. Silvicultural objectives.

- e. Critical components (aspect, water courses, landform, etc.).
  - f. Habitat types.
  - g. Potential effects on water quality and beneficial water uses.
  - h. Watershed condition and cumulative effects of multiple timber management activities on water yield and sediment production.
  - i. Wildlife habitat.
2. Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.
  3. Use the economically feasible yarding system that will minimize road densities.
  4. Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limiting site disturbance and soil compaction. Consider the potential for erosion and possible alternative yarding systems prior to planning tractor skidding on steep or unstable slopes.
  5. Locate skid trails to avoid concentrating runoff and provide breaks in grade. Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas. Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30%. Use mitigating measures, such as water bars and grass seeding, to reduce erosion on skid trails.
  6. Minimize the size and number of landings to accommodate safe, economical operation. Avoid locating landings that require skidding across drainage bottoms.

## **B. Other Harvesting Activities**

1. Tractor skid where compaction, displacement, and erosion will be minimized. Avoid tractor or wheeled skidding on unstable, wet, or easily compacted soils and on slopes that exceed 40% unless operation can be conducted without causing excessive erosion. Avoid skidding with the blade lowered. Suspend leading ends of logs during skidding whenever possible.
2. Avoid operation of wheeled or tracked equipment within isolated wetlands, except when the ground is frozen (see Section VI on winter logging).
3. Use directional felling or alternative skidding systems for harvest operations in isolated wetlands.

4. For each landing, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.
5. Insure adequate drainage on skid trails to prevent erosion. On gentle slopes with slight disturbance, a light ground cover of slash, mulch or seed may be sufficient. Appropriate spacing between water bars is dependent on the soil type and slope of the skid trails. Timely implementation is important.
6. When existing vegetation is inadequate to prevent accelerated erosion, apply seed or construct water bars before the next growing season on skid trails, landings and fire trails. A light ground cover of slash or mulch will retard erosion.

#### **C. Slash Treatment and Site Preparation**

1. Rapid reforestation of harvested areas is encouraged to reestablish protective vegetation.
2. When piling slash, care should be taken to preserve the surface soil horizon by using appropriate techniques and equipment. Avoid use of dozers with angle blades.
3. Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification.
4. Scarify the soil only to the extent necessary to meet the resource management objectives. Some slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.
5. Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.
6. Carry out scarification on steep slopes in a manner that minimizes erosion. Broadcast burning and/or herbicide application is preferred means for site preparation, especially on slopes greater than 40%.
7. Remove all logging machinery debris to proper disposal site.
8. Limit water quality impacts of prescribed fire by constructing water bars in firelines; not placing slash in drainage features and avoiding intense fires unless needed to meet silvicultural goals. Avoid slash piles in the SMZ when using existing roads for landings.

## **A. Legal Requirements**

1. Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed or immediate banks must be approved in advance by the supervisors of the local conservation district. Permanent or temporary stream crossing structures, fords, riprapping or other bank stabilization measures, and culvert installations on perennial streams are some of the forestry-related projects subject to 310 permits.

Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans. The evaluation generally includes on-site review, and the permitting process may take up to 60 days.

2. Stream-crossing projects initiated by federal, state or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks), rather than the 310 permit.
3. A short-term exemption (3a authorization) from water quality standards is necessary unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. Contact the Department of Environmental Quality in Helena at 444-2406 for additional information.

## **B. Design Considerations (Note: 310 permit required for perennial streams)**

1. Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage to stream crossings. Direct drainage flows away from the stream crossing site or into an adequate filter.
2. Avoid unimproved stream crossings. When a culvert or bridge is not feasible, locate drive-throughs on a stable, rocky portion of the stream channel.

## **C. Installation of Stream Crossings (Note: 310 permit required for perennial streams)**

1. Minimize stream channel disturbances and related sediment problems during construction of road and installation of stream crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.



2. When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provides seasonal fish passage. Ensure fish movement is not impeded. Place culverts slightly below normal stream grade to avoid culvert outfall barriers. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage.
3. Design stream-crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, the 25-year frequency runoff. Consider oversized pipe when debris loading may pose problems. Ensure sizing provides adequate length to allow for depth of road fill.
4. Install culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where feasible.
5. Consider dewatering stream crossing sites during culvert installation.
6. Maintain a 1-foot minimum cover for culverts 15 to 36 inches in diameter, and a cover of one-third diameter for larger culverts, to prevent crushing by traffic.
7. Use culverts with a minimum diameter of 15 inches for permanent stream crossings and cross drains.

## **VI. Winter Logging**

### **A. General**

1. Consider snow-road construction and winter harvesting in isolated wetlands and other areas with high water tables or soil erosion and compaction hazards.
2. Conduct winter logging operations when the ground is frozen or snow cover is adequate (generally more than one foot) to prevent rutting or displacement of soil. Be prepared to suspend operations if conditions change rapidly, and when the erosion hazard becomes high.
3. Consult with operators experienced in winter logging techniques.

## **B. Road Construction and Harvesting Considerations**

1. For road systems across areas of poor bearing capacity, consider hauling only during frozen periods. During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade prior to hauling.
2. Before logging, mark existing culvert locations. During and after logging, make sure that all culverts and ditches are open and functional.
3. Use compacted snow for road beds in unroaded, wet or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.
4. In wet, unfrozen soil areas, use tractors or skidders to compact the snow for skid road locations only when adequate snow depth exists. Avoid steeper areas where frozen skid trails may be subject to erosion the next spring.
5. Return the following summer and build erosion barriers on any trails that are steep enough to erode.

## **VII. HAZARDOUS SUBSTANCES**

### **A. General**

1. Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. Follow all label instructions.
2. Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the State Department of Environmental Quality.

### **B. Pesticides and Herbicides**

1. Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventive and chemical means.
2. To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.